

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

BMT1814 – MANAGERIAL MATHEMATICS

(All sections / Groups)

6 MARCH 2019

2.30 p.m. – 4.30 p.m.

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **FIVE (5)** printed pages with 4 questions only, excluding the cover page.
2. Answer all **FOUR (4)** questions.
3. Write all your answers in the answer booklet provided. All necessary workings **MUST** be shown.
4. Mathematical formula is attached at the end of this question paper.

Question 1 (25 marks)

- (a) Given that L1 is a straight line that passes through the points (1, 2) and (5, 3).
- (i) Find an equation of line L1. [6 marks]
- (ii) Find an equation of the line that passing through point (-2, 3) and is perpendicular to the line L1. [6 marks]
- (b) Solve the following linear programming problem by using the method of corners.
- $$\begin{array}{ll}\text{Maximize} & P = 2x + 4y \\ \text{Subject to} & 2x + 2y \leq 8 \\ & 4x + 2y \leq 10 \\ & x \geq 0, y \geq 0\end{array}$$
- [13 marks]

Question 2 (25 marks)

- (a) A bank paying simple interest that grew from an initial sum of RM2,000 to a sum of RM3,500 in 2 years. Find the interest rate. [5 marks]
- (b) Find the effective rate of interest corresponding to a nominal rate of 12% per year compounded
- (i) semi-annually, [3 marks]
- (ii) monthly. [3 marks]
- (c) Lim deposited RM400 at the end of every month into a bank account that pays interest at the rate 4% compounded monthly. After 10 years, how much money will Lim has in his account? [7 marks]
- (d) Salman plan to buy a house costing RM450,000. He need to pay 10% down payment and the rest is to be amortized over 35 years in equal monthly payments. If the money costs 6% compounded monthly, what will be his monthly payment for the house? [7 marks]

Continued...

Question 3 (25 marks)

(a) Find the first derivative of the following functions.

(i) $y = 4x^4 - 3x^3 + 5x^2 + 1$

[3 marks]

(ii) $y = \frac{2}{5x^4} - \frac{2}{x^2}$

[2 marks]

(iii) $y = (x+2)(6\sqrt{x}+3)$

[6 marks]

(iv) $y = \frac{x^3 - 1}{2x^2 + 4}$

[6 marks]

(b) Find the partial derivatives $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ for the function

$f(x, y) = x^2 - 2xy + 2y^2 + x - 2y$. Next, compute $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ at the point $(1, 3)$.

[8 marks]

Continued...

Question 4 (25 marks)

- (a) Evaluate each of the following integrals:

(i) $\int (2 + 2x^3 + 4x^2) dx$

[4 marks]

(ii) $\int_1^2 (3x^4 - 2x^2 + 6) dx$

[4 marks]

- (b) The total costs (in Ringgit Malaysia) for producing water heaters are given by the following function

$$C(x) = 0.01x^4 - 0.06x^3 + 2x^2 + 4500$$

where x is the number of units produced daily.

- (i) Find the marginal cost function.

[3 marks]

- (ii) Find the average cost function, $\bar{C}(x)$.

[5 marks]

- (iii) Find the marginal average cost function, $\bar{C}'(x)$. Then, compute $\bar{C}'(360)$.

[4 marks]

- (c) Smart Publishing publishes a deluxe edition and standard edition of its Arabic language dictionary. Smart's management estimates that the number of deluxe editions demanded is x copies per day and the number of standard editions demanded is y copies per day when the unit prices in Ringgit Malaysia are

$$p(x, y) = 30 - 0.004x - 0.003y$$

$$q(x, y) = 20 - 0.002x - 0.001y$$

respectively. Find the daily total revenue function, $R(x, y)$.

[5 marks]

End of Question Page.

Summary of Principal Formulas and Terms

1. Quadratic Formula

The solution of the equation: $ax^2 + bx + c = 0$ where $a \neq 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

2. Simple Interest

- (i) Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
- (ii) Accumulated amount, $A = P(1 + rt)$

3. Compound Interest

- (i) Accumulated amount, $A = P(1 + i)^n$, where $i = \frac{r}{m}$, and $n = mt$
(m = number of conversion periods per year)
- (ii) Present value for compound interest, $P = A(1 + i)^{-n}$

4. Effective Rate of Interest

$$r_{\text{eff}} = \left[1 + \frac{r}{m}\right]^m - 1$$

5. Future Value of an Annuity

$$S = R \left[\frac{(1 + i)^n - 1}{i} \right] \quad (S = \text{future value of ordinary annuity of } n \text{ payments of } R \text{ dollars periodic payment})$$

6. Present Value of an Annuity

$$P = R \left[\frac{1 - (1 + i)^{-n}}{i} \right] \quad (P = \text{present value of ordinary annuity of } n \text{ payments of } R \text{ dollars periodic payment})$$

7. Amortization Formula

$$R = \frac{Pi}{1 - (1 + i)^{-n}} \quad (R = \text{periodic payment on a loan of } P \text{ dollars to be amortized over } n \text{ periods})$$

8. Sinking Fund Formula

$$R = \frac{Si}{(1 + i)^n - 1} \quad (R = \text{periodic payment required to accumulate } S \text{ dollars over } n \text{ periods})$$

9. Basic Rules of Differentiation

- (a) Derivative of a constant: If $f(x)$ is a constant, then $f'(x) = 0$
- (b) Power rule: If $f(x)$ is x^n , then $f'(x) = nx^{n-1}$

- (c) Constant multiple rule: $\frac{d}{dx}[cf(x)] = cf'(x)$ (c is a constant)
- (d) Sum rule: $\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$
- (e) Product rule: If $f(x) = u(x) \cdot v(x)$, then $f'(x) = u(x)v'(x) + v(x)u'(x)$
- (f) Quotient rule: $f'(x) = \frac{d}{dx}\left[\frac{u(x)}{v(x)}\right] = \frac{v(x)u'(x) - u(x)v'(x)}{[v(x)]^2}$
- (g) Chain rule: $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$
- (h) General power rule: $\frac{d}{dx}[f(x)]^n = n[f(x)]^{n-1} f'(x)$
- (i) Exponential function: $\frac{d}{dx}(e^u) = e^u [u'(x)]$
- (j) Logarithmic function: $\frac{d}{dx}(\ln u) = \left(\frac{1}{u}\right)[u'(x)]$

10. Basic Rules of Integration

- (a) Indefinite integral of a constant: $\int k \, du = ku + C$
- (b) Power rule: $\int u^n \, du = \frac{u^{n+1}}{n+1} + C$
- (c) Constant multiple rule: $\int kf(u) \, du = k \int f(u) \, du$ where k is a constant
- (d) Sum rule: $\int [f(u) \pm g(u)] \, du = \int f(u) \, du + \int g(u) \, du$
- (e) Exponential function: $\int e^u \, du = e^u + C$
- (f) Logarithmic function: $\int \left(\frac{1}{u}\right) \, du = \ln u + C$

11. Determining Relative Extremes

$$D(x, y) = f_{xx}f_{yy} - (f_{xy})^2$$

If $D > 0$ and $f_{xx} > 0$, relative minimum point occurs at (x, y) .

If $D > 0$ and $f_{xx} < 0$, relative maximum point occurs at (x, y) .

If $D < 0$, (x, y) is neither maximum nor minimum.

If $D = 0$, the test is inconclusive.

